

Claims

What is claimed is:

- 5 1. A method for reducing noise in an image sequence comprising the steps of:
obtaining a current parameter value for a current instance of a pixel;
determining a difference between a previous parameter value for a previous
instance of the pixel and the current parameter value;
when the difference is greater than a threshold, producing a new parameter value
10 using the current parameter value; and
when the difference is less than the threshold, producing the new parameter value
by combining the previous parameter value and the current parameter value in a variable
ratio, the variable ratio depending on the difference.
- 15 2. The method of claim 1 wherein the step of producing the new parameter value
using the current parameter value occurs independent of the previous parameter value.
3. The method of claim 1 wherein the step of determining the difference between the
previous parameter value for the previous instance of the pixel and the current parameter
20 value is performed for a plurality of pixel parameters.
4. The method of claim 3 wherein the plurality of pixel parameters are selected from
a group consisting of:
a red parameter;
25 a green parameter;
a blue parameter;
a cyan parameter;
a magenta parameter;
a yellow parameter;
30 a chrominance parameter;
a luminance parameter;

a transparency parameter;
a texture parameter;
a grayscale parameter;
an opacity parameter;
5 a color parameter;
a fog parameter;
a lighting parameter;
a layer parameter; and
a depth parameter.

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5. The method of claim 1 wherein the step of determining the difference between the previous parameter value for the previous instance of the pixel and the current parameter value is performed for on the pixel as a whole.

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6. A method for reducing noise in an image sequence comprising the steps of:
obtaining a current parameter value for a current instance of a pixel;
determining a difference between a previous parameter value for a previous instance of the pixel and the current parameter value;
when the difference is less than a lower threshold, producing a new parameter value for the current instance of the pixel by combining the previous parameter value and the current parameter value in a fixed ratio;
20 when the difference is greater than a higher threshold, producing the new parameter value using the current parameter value; and
when the difference is between the lower threshold and the higher threshold,
25 producing the new parameter value by combining the previous parameter value and the current parameter value in a variable ratio, the variable ratio depending on the difference.

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7. The method of claim 6 wherein the step of producing the new parameter value using the current parameter value occurs independent of the previous parameter value.

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8. The method of claim 6 wherein the variable ratio changes linearly as a function of difference.

9. The method of claim 8 wherein the variable ratio is expressed as a previous-parameter-value-to-current-parameter-value ratio between 0:1 and the fixed ratio.

10. The method of claim 9 wherein the fixed ratio is greater than 1:1.

11. The method of claim 9 wherein the fixed ratio is greater than 2:3.

12. The method of claim 9 wherein the fixed ratio is between 13:7 and 19:1.

13. The method of claim 9 wherein the fixed ratio is between 7:3 and 9:1.

14. The method of claim 9 wherein the fixed ratio is between 3:1 and 17:3.

15. A method for reducing noise in an image sequence comprising the steps of:
obtaining a current parameter value for a current instance of a pixel;
determining a difference between a previous parameter value for a previous
instance of the pixel and the current parameter value;
when the difference is less than a lower threshold, producing a new parameter
value for the current instance of the pixel by combining the previous parameter value and
the current parameter value in a first ratio;

when the difference is greater than a higher threshold, producing the new
parameter value using the current parameter value; and

when the difference is between the lower threshold and the higher threshold,
producing the new parameter value by combining the previous parameter value and the
current parameter value in a second ratio, the second ratio being more heavily weighted
toward the current parameter value than the first ratio.

16. The method of claim 15 wherein the second ratio incorporates more of the current parameter value relative to the previous parameter value than is incorporated by the first ratio.

5 17. A method for reducing noise in an image sequence comprising the steps of:
obtaining a current property for a current instance of a pixel;
determining a difference between a previous property for a previous instance of
the pixel and the current property;
when the difference is less than a threshold, producing a new property for the
10 current instance of the pixel by combining the previous property and the current property
in a fixed ratio;
when the difference is greater than the threshold, producing the new property by
combining the previous property and the current property in a variable ratio, the variable
ratio depending on the difference.

15 18. The method of claim 17 wherein the current property is a current parameter value
for the current instance of the pixel, the previous property is a previous parameter value
for the previous instance of the pixel, and the new property is a new parameter value.

20 19. The method of claim 17 wherein the current property collectively includes a
plurality of current parameter values for the current instance of the pixel, the previous
property collectively includes a plurality of previous parameter values for the previous
instance of the pixel, and the new property includes a plurality of new parameter values.

25 20. Apparatus for reducing noise in an image sequence comprising:
an absolute difference calculator operatively coupled to receive a current property
of a current instance of a pixel and a previous property of a previous instance of a pixel
and to provide an absolute difference of the current property and the previous property;
a blending factor determination block operatively coupled to the absolute
30 difference calculator to receive the absolute difference and to provide a blending factor;

a new property calculator operatively coupled to the blending factor determination block to receive the blending factor, the previous property, and the current property and to provide a new property, the new property used to display the pixel in the image sequence.

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21. The apparatus of claim 20 wherein the blending factor determination block further comprises:

a higher threshold comparator operatively coupled to the absolute difference calculator to receive the absolute difference and to indicate a blending factor to cause the new property calculator to provide the new property based on the current property independent of the previous property when the absolute difference is greater than a higher threshold;

a lower threshold comparator operatively coupled to the absolute difference calculator to receive the absolute difference and to indicate a blending factor to cause the new property calculator to provide the new property based on a fixed ratio of the previous property to the current property when the absolute difference is less than a lower threshold; and

a blending factor calculator to indicate a blending factor to cause the new property calculator to provide the new property based on a variable ratio of the previous property to the current property when the absolute difference is between the lower threshold and the higher threshold.

22. The apparatus of claim 21 wherein the variable ratio exhibits an inverse linear relationship with the absolute difference between the lower threshold and the higher threshold.

23. The apparatus of claim 21 wherein the fixed ratio is greater than 1:1.

24. The apparatus of claim 21 wherein the fixed ratio is greater than 2:3.

25. The apparatus of claim 21 wherein the fixed ratio is between 13:7 and 19:1.

- a magenta parameter;
- a yellow parameter;
- a chrominance parameter;
- a luminance parameter;
- a transparency parameter;
- a texture parameter;
- a grayscale parameter;
- an opacity parameter;
- a color parameter;
- a fog parameter;
- a lighting parameter;
- a layer parameter; and
- a depth parameter.

32. The program storage device of claim 28 wherein the step of determining the difference between the previous parameter value for the previous instance of the pixel and the current parameter value is performed for on the pixel as a whole.

33. A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform a method for reducing noise in an image sequence, the method comprising the steps of:

obtaining a current parameter value for a current instance of a pixel;

determining a difference between a previous parameter value for a previous instance of the pixel and the current parameter value;

when the difference is between the lower threshold and the higher threshold, producing the new parameter value by combining the previous parameter value and the current parameter value in a variable ratio, the variable ratio depending on the difference.

5 34. The program storage device of claim 33 wherein the step of producing the new parameter value using the current parameter value occurs independent of the previous parameter value.

10 35. The program storage device of claim 33 wherein the variable ratio changes linearly as a function of difference.

15 36. The program storage device of claim 35 wherein the variable ratio is expressed as a previous-parameter-value-to-current-parameter-value ratio between 0:1 and the fixed ratio.

37. The program storage device of claim 36 wherein the fixed ratio is greater than 1:1.

20 38. The program storage device of claim 36 wherein the fixed ratio is greater than 2:3.

39. The program storage device of claim 36 wherein the fixed ratio is between 13:7 and 19:1.

25 40. The program storage device of claim 36 wherein the fixed ratio is between 7:3 and 9:1.

41. The program storage device of claim 36 wherein the fixed ratio is between 3:1 and 17:3.

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42. A program storage device readable by a machine, tangibly embodying a program of instructions executable by the machine to perform a method for reducing noise in an image sequence, the method comprising the steps of:

obtaining a current parameter value for a current instance of a pixel;

determining a difference between a previous parameter value for a previous instance of the pixel and the current parameter value;

when the difference is less than a lower threshold, producing a new parameter value for the current instance of the pixel by combining the previous parameter value and the current parameter value in a first ratio;

when the difference is greater than a higher threshold, producing the new parameter value using the current parameter value; and

when the difference is between the lower threshold and the higher threshold, producing the new parameter value by combining the previous parameter value and the current parameter value in a second ratio, the second ratio being more heavily weighted toward the current parameter value than the first ratio.

43. The method of claim 42 wherein the second ratio incorporates more of the current parameter value relative to the previous parameter value than is incorporated by the first ratio.

44. A program storage device for reducing noise in an image sequence comprising the steps of:

obtaining a current property for a current instance of a pixel;

determining a difference between a previous property for a previous instance of the pixel and the current property;

when the difference is less than a threshold, producing a new property for the current instance of the pixel by combining the previous property and the current property in a fixed ratio;

when the difference is greater than the threshold, producing the new property by combining the previous property and the current property in a variable ratio, the variable ratio depending on the difference.

45. The program storage device of claim 44 wherein the current property is a current parameter value for the current instance of the pixel, the previous property is a previous parameter value for the previous instance of the pixel, and the new property is a new parameter value.

46. The program storage device of claim 44 wherein the current property collectively includes a plurality of current parameter values for the current instance of the pixel, the previous property collectively includes a plurality of previous parameter values for the previous instance of the pixel, and the new property includes a plurality of new parameter values.

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